Bridging Diagnostic Gaps: A multiparametric correlation of PSA and Sonographic Findings to Enhance BPH Evaluation in Resource-Limited Nigerian Settings

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Abstract

This study examines the relationship between serum prostate-specific antigen (PSA) levels and sonographic findings in men with histologically confirmed benign prostatic hyperplasia (BPH) at Evercare Hospital, Lekki (June 2020–June 2025). Data from 85 patients were analyzed for PSA, prostate volume, gland margins, echotexture, and bladder indices. Findings revealed significant correlations between PSA levels and ultrasound parameters, underscoring ultrasound as an accessible, cost-effective diagnostic complement to PSA testing. In a context where advanced procedures and biopsies remain costly, this integration supports equitable, early evaluation of prostate disease and informs region-specific PSA standards for African populations

Objective

Background:
PSA testing is a key biomarker in evaluating prostate disease but can be cost-prohibitive when paired with confirmatory imaging or biopsy in resource-limited regions. In Nigeria, ultrasound remains more widely available, providing an avenue for equitable diagnostic access.

Objectives:

- Assess correlations between PSA levels and sonographic markers in confirmed BPH cases.
- Evaluate the potential of ultrasound as a frontline, affordable diagnostic tool in prostate disease management.
- Support advocacy for PSA reference standards informed by existing literature on higher baseline levels in African and Nigerian male populations.

Methods

Design: Retrospective cohort (June 2020–June 2025).
Population: 85 male patients ≥40 with histologically confirmed BPH.
Data Collection: Electronic health records and ultrasound databases.
Laboratory: Venipuncture for PSA collection and analysis via chemiluminescent immunoassay. Biopsy performed in cases with irregular margins or elevated PSA (>4ng/mL)
Ultrasound protocol: Consona N7 (3.5–5.0 MHz) transabdominal prostate measured in 3D, volume by ellipsoid formula (L × W × H × 0.52). Recorded prostate size, echotexture, margin regularity, calcifications, post-void residual bladder volume, and bladder wall thickness.

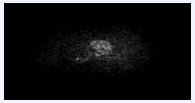


Fig 1. DWI shows a hyperintense lesion (restricted diffusion)

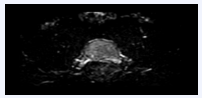
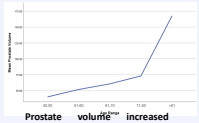


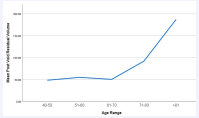
Fig 2. ADC shows a hypointense lesion.

Results

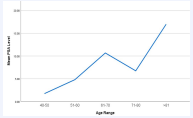
Demographic Correlation with Prostatic and Bladder Measures:
Positive age correlation with mean PSA levels, prostate volume, and post-void residual bladder volume indicates an increase in mean PSA levels as age increases.



Prostate volume increased steadily with age, from ~45 mL in the 40–50 year group to ~170 mL in those over 81 years.



PVR volumes were stable (50–60 mL) across ages 40–70 but rose sharply to ~95 mL in ages 71–80 and ~190 mL above 81 years.

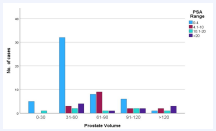


PSA levels increased with age, peaking at ~11 ng/mL in men aged 61–70 and reaching ~17 ng/mL in those over 81 years.

Prostate Indices Correlation:

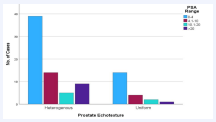
Prostate Volume

Low PSA levels (<4 ng/mL) were predominant in smaller prostates, seen in 83% of Grade I and 78% of Grade II enlargements. As prostate volume increased, the proportion of elevated PSA values (>10 ng/mL) rose steadily, with 42.9% of patients with volumes >120 cc showing PSA >20 ng/mL.



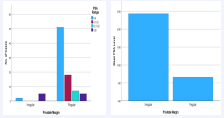
Prostate Echotexture

Elevated PSA levels were more common in patients with heterogeneous echotexture, where 13.4% had PSA >20 ng/mL compared to only 4.8% in the uniform group. Overall, the heterogeneous group accounted for most cases across all PSA ranges, while uniform echotexture was largely associated with PSA <4 ng/mL.



Prostate Margin

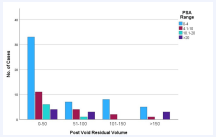
Patients with irregular prostate margins showed markedly elevated PSA levels, with 71.4% recording values above 20 ng/mL compared to only 6.2% among those with regular margins (63%) had PSA <4 ng/mL.



Bladder Indices Correlation:

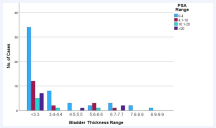
Post Void Residual Volume

Patients with moderate PVR (51–100 mL) showed the highest proportion of elevated PSA >20 ng/mL (20%), while those with very high PVR (>150 mL) also had a notable increase (33.3%). In contrast, most patients with low PVR (<50 mL) had normal PSA levels (<4 ng/mL).



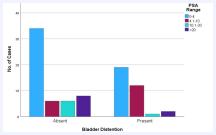
Bladder thickness

Patients with normal or mildly thickened bladder walls (<4.4 mm) mostly had normal PSA levels, with 58.6–72.7% recording PSA <4 ng/mL. However, those with more significant thickening (6.7–7.7 mm) showed higher rates of elevated PSA, with one-third (33.3%) exceeding 20 ng/mL. with regular margins (63%) had PSA <4 ng/mL.



Bladder distention

Among patients without bladder distention, PSA elevation was more pronounced, with 14.8% showing values above 20 ng/mL. In contrast, those with bladder distention largely had PSA <10 ng/mL



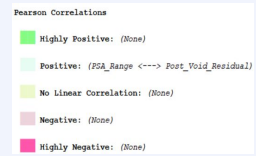
Discussions

PSA levels showed age-related increases consistent with benign prostate enlargement, while prostate volume and post-void residual (PVR) rose proportionally with age and PSA. Irregular margins and bladder wall thickening aligned with higher PSA levels, suggesting structural changes accompanying BPH progression.

These findings highlight ultrasound as a practical diagnostic ally, especially where high testing costs limit access to biopsy or MRI. Given the higher baseline PSA levels observed among Nigerian men, integrating sonographic data helps refine interpretation, reducing unnecessary interventions and promoting cost-effective, equitable care.

Correlations

		PSA_Range	Post_Void_Residual
PSA_Range	Pearson Correlation	1	.245*
	Sig. (2-tailed)		.021
	N	88	88
Post_Void_Residual	Pearson Correlation	.245*	1
	Sig. (2-tailed)	.021	
	N	88	88



Conclusions

This study demonstrates that sonographic parameters—prostate volume, margin irregularity, and PVR strongly correlate with PSA elevations in BPH. Ultrasound provides a reliable, affordable, and potential accessible diagnostic pathway, essential for advancing men's health equity in Nigeria.

The consistently higher PSA ranges observed in Nigerian and other African men emphasize the need for region-specific reference values. Establishing locally relevant diagnostic standards will improve accuracy, reduce unnecessary invasive testing, and promote more equitable prostate health care across diverse populations.

Additional Questions?

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